

R E P O R T R E S U M E S

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IDENTIFICATION OF INSTRUMENTS TO MEASURE SELECTED FACTORS
RELATED TO SUCCESS IN BEGINNING READING OF CHILDREN OF
DIFFERENT SOCIO-ECONOMIC STRATA.

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PERCEPTION, AUDITORY PERCEPTION, MEASUREMENT INSTRUMENTS,
GOODENOUGH DRAW A MAN SCALE, WEPMAN'S AUDITORY DISCRIMINATION
TEST, METROPOLITAN READINESS TESTS, CHICAGO, ILLINOIS

A LONGITUDINAL STUDY WAS PERFORMED WHICH FOLLOWED THREE
GROUPS OF CHILDREN (CULTURALLY DISADVANTAGED, AVERAGE, AND
CULTURALLY ADVANTAGED) THROUGH GRADE THREE IN AN ATTEMPT TO
DETERMINE THE RELATIVE IMPORTANCE OF THE DEVELOPMENT OF
CERTAIN PERCEPTUAL FACTORS ON SUCCESS OR FAILURE IN BEGINNING
READING. INSTRUMENTS USED WERE SELECTED TO IDENTIFY VISUAL,
AUDITORY, AND VISUOMOTOR ABILITIES, PLUS THE EXTENT OF
CONCEPT FORMATION. INSTRUMENTS USED INCLUDED THE GOODENOUGH
DRAW-A-MAN SCALE, WEPMAN'S AUDITORY DISCRIMINATION TEST,
METROPOLITAN READINESS TESTS, COLUMBIA MENTAL MATURITY SCALE,
DURELL'S LETTER DISCRIMINATION TEST, THE WORD DISCRIMINATION
TEST, THE VISUOMOTOR TEST, METROPOLITAN ACHIEVEMENT TESTS
(READING), THE MAICO AUDIOMETER, AND VISUAL EFFICIENCY TEST
WITH THE ORTHO-RATER. SEVEN OF THE 11 INSTRUMENTS USED WERE
FOUND TO BE RELIABLE, AND THE USABILITY OF EACH WAS
RECOMMENDED FOR SPECIFIC TYPES OF SUBJECTS. FOUR INSTRUMENTS
NEEDED FURTHER DEVELOPMENT OR EVALUATION. (JP)

**Identification of Instruments to Measure Selected Factors
Related to Success in Beginning Reading of Children of
Different Socio-Economic Strata**

**U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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Cooperative Research Project No. S-147

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I. Problem

In 1926 the International Kindergarten Union in cooperation with the United States Bureau of Education conducted an investigation entitled Pupils' Readiness for Reading Instruction Upon Entrance to First Grade. From this time forward investigators have been concerned with the measurement of factors related to success in beginning reading. Numerous factors have been considered: chronological age, mental age or intelligence, visual discrimination, auditory discrimination, sex, kindergarten attendance, experience background, et cetera.

Although studies of these factors among young children are increasing, there has been a paucity of research in the early grades. Most of the studies of these factors assumed to be related to reading success or failure have been conducted with older students.

One of the reasons for the scarcity of research reports appears to be that most of the conclusions about factors related to reading success or failure have been drawn at upper grade levels with retarded readers. Another reason for the paucity of studies, however, is the lack of reliable instruments designed to measure many of these factors in the early grades.

The factors which appear to be most closely related to success or failure in beginning reading are auditory and visual perception and, perhaps, visuo-motor performance. Hence, this investigation along with a number being conducted concurrently, attempted to identify instruments that can measure these factors. In addition tests of reading readiness, reading achievement, intelligence, and concept formation were considered.

Socio-economic level. Youngsters from culturally-advantaged environments tend to be successful in learning to read in the early grades and continue to be high achievers in reading throughout their

school careers. Youngsters from culturally-disadvantaged environments tend to be rather unsuccessful in learning to read in the early grades and continue to be low achievers in reading throughout their school careers. It appears that these patterns may be influenced by a number of factors, most specifically weaknesses or strengths in visual and auditory perceptual abilities in the early grades.

If these factors are at all influential, it is imperative that they be viewed with reliable instruments, as reliable for the disadvantaged group as for the advantaged or average. Too often conclusions are reached and training plans instituted on the basis of results obtained with instruments of low or questionable reliability.

In a pilot study conducted by this investigator, visuo-motor and visual perception instruments were constructed and tested with "average" kindergarten children who were also tested with existing instruments purported to measure auditory perception, reading readiness, intelligence, visual acuity, and binocular coordination. The instruments used and tested in this earlier study were employed, sometimes with modification, in this investigation of three socio-economic groups at kindergarten, first, second, and third grade levels.

Knowledge of the reliability of certain instruments at particular grade levels and with specific groups of children will facilitate cross-sectional or longitudinal studies of reading ability and perceptual factors related to reading success or failure. There is great need for careful exploration of the learning modalities of children as they relate to reading instruction. With reliable instruments investigators may be able to determine relationships between the stage of development of each of the learning modalities and varying degrees of success or failure for children in the early stages of reading.

II. Objectives

The primary objective of this investigation was the identification of instruments to measure selected factors related to success in beginning reading of children of different socio-economic strata. The specific factors considered were: (a) visual efficiency; (b) auditory acuity; (c) visual discrimination; (d) auditory discrimination; (e) visuo-motor ability; (f) concept formation; (g) intelligence; (h) reading readiness. The reliability of a standardized reading test was also computed for each of three socio-economic groups.

The identification of instruments to measure these factors was limited to kindergarten, grade one, grade two, and grade three. Hence, in actuality, the major objective was to determine the reliability of the various instruments at four grade levels among culturally advantaged, average, and culturally disadvantaged groups of children.

A second objective was to design reliable instruments to test visuo-motor ability and visual perception of letters and words for kindergarten and grade one. An additional objective was to determine whether or not a modification in the giving of directions for several of the tests would increase their reliability when used with very young children.

III. Related Research

In a review of the research concerned with factors related to success in reading, Helen Robinson (1955) concluded that "research leaves many questions unanswered concerning abilities possessed by the pupil which influence his learning to read." She suggested that "visual perception should receive more attention and auditory perception is also important."

Visual Perception. Numerous investigators (Barrett, 1965; Gates, 1926 and 1939; Gates, Bond, and Russell, 1939; Gavel, 1958; Goetzinger, Dirks and Baer, 1960; Sister Mary, 1929; Sister Niala, 1953; Sister Phelan, 1940; Smith, 1928; Wilson, 1942) found high positive correlations between visual discrimination and reading when discrimination tests composed of "reading-type" stimuli (letters, syllables, words) are used, whereas when the test stimuli are non-verbal (geometric shapes, digits), there exists a positive but low correlation. Goins (1958), however, found a fairly high (.49) correlation between tests of non-verbal, perceptual tasks and reading achievement at the end of grade one. Benton (1962) reviewed the research in this area and reached the following conclusions: "A certain level of visual discriminative capacity is obviously a necessary precondition for learning to read, and there is variation in the development of these visuo-perceptive skills in the early years of life. Significant retardation in development which extends into the early school years will then necessarily entail a corresponding retardation in learning to read." In Vernon's review (1957) of over fifty studies of visual perception, she concluded that young children have difficulty in accurately perceiving and recalling small details of shape, in selecting significant details, and in perceiving the orientation of shapes in space. Vernon (1957) also pointed out that too many of the studies of visual perception were conducted with adults. She suggested the need for more studies in this area with children.

Auditory perception. Various studies (Goetzinger, Dirks and Baer, 1960; Katz and Deutsch, 1963; Poling, 1953; Wepman, 1960) reveal that auditory discrimination abilities are related to success in beginning reading. These studies show that: (1) there is a consistent increase in sound discrimination with age; (2) some children develop more slowly than others in sound discrimination; (3) some children have not reached maturation in this ability by the end of grade two.

Sister Nila (1953), in a factor analysis study, found that auditory discrimination was the chief factor related to reading readiness. Deutch (1964), finding that poor readers had more difficulty than good readers with auditory discrimination, suggested that a minimum level of auditory discrimination skill is needed in order to learn reading skills.

Wepman (1960) stated that "Children should be studied as they reach school age to determine whether their auditory abilities have reached the level of maturation where they can benefit from phonic instruction. . . . The important thing seems to be the early recognition of the problems and the effect that later developing auditory discrimination may have on the child's reading."

Visuo-motor ability. Few studies emphasize the visual-kinesthetic or visuo-motor function. This area needs more complete investigation for the limited research reports have produced opposing results. Two studies point toward a relationship between reading retardation and visuo-motor ability (Castner, 1935; Walters, 1961). Yet some investigators conclude that the relationship of visuo-motor ability and reading may only be significant in very young children (Benton, 1962). On the other hand, three investigators (Allen, 1959; Blessington, 1950; Saunders, 1947) reported correlations of .03 to .27 when motor skills were related to beginning readers. Recent evidence, however, (Barrett, 1965), rates pattern copying only second to letter and number recognition as a predictor of first grade reading achievement.

Auditory-visual shifting. There is some evidence that demonstrates a problem for poor readers may lie in the ability to shift from one modality to the other (Katz and Deutsch, 1963; Raab, Deutsch, and Freedman, 1960). The results of such investigations may introduce another factor to be considered when assessing those variables which when measured in the early grades may bear a relationship to future success or failure in reading.

Environmental influences. Goins (1958). Leider (1955), Reed (1958), and Ryan (1964) concluded that the influence of perceptual factors on reading declined often at or after grade three.

However, Katz and Deutsch (1963) in their study of retarded readers from deprived environments, found that measures of visual and auditory perception differentiated good from poor readers. They suggested that perceptual measures ". . . might be obtained from children entering school in order to arrive at a more accurate diagnosis of potential reading problems." Deutsch (1964) concluded that retardation in auditory discrimination among culturally disadvantaged children was a result of environmental deprivation. Weiner and Feldman claim that poor readers from any socio-economic status can be identified prior to formal training in reading, and that their skill deficiencies (meaning auditory and visual discrimination) underlying reading can be ascertained.

In light of what we appear to know and certainly in relation to what we do not know, it seems essential that we identify or design dependable instruments. When engaged in research with human beings, particularly small children, there is always the danger of drawing conclusions and making recommendations based on results of questionable reliability let alone validity. This investigation has attempted to take a few steps in the direction of identifying reliable instruments.

IV. Procedure

A. Subjects

Subjects were selected from kindergarten, grade 1, grade 2, and grade 3 in three school systems. One class at each level was chosen making a total of 12 classrooms. Table 1 below presents the total number and distribution of the subjects, although N's vary in subsequent tables since all subjects were not used for all tests.

Table 1
Distribution of Subjects in the Study

	Disadvantaged	Average	Advantaged
Kindergarten	147	54	31
1st Grade	36	47	25
2nd Grade	36	35	25
3rd Grade	34	34	25
Total	253	170	106

The disadvantaged school is a public school located in the Woodlawn area of Chicago and representative of the lower socio-economic strata. All of the subjects in this sample were Negroes coming primarily from apartment dwellings. Most often fathers were not present in the homes and mothers were either working or on relief. The average school is a public school servicing a lower-to-middle class population in Cicero, Illinois, a suburb of Chicago. All of the subjects in this sample were Caucasian coming mainly from small private homes. Homes were normally intact and fathers were semi-skilled laborers, skilled workers, or business people. A number of the mothers worked. The advantaged school is a private school in Chicago conducted in affiliation with a university. Most of the subjects in this sample came from private homes and fathers were essentially professionals or business executives. Few mothers worked full-time. The subjects were mainly Caucasian, although there was a fairly high percentage (approximately 25 per cent) of children with Negro or Oriental background in the group.

The kindergarteners in the disadvantaged school and in the average school were given the complete battery of tests except for a standardized reading test; those in the advantaged school received all but a concept formation test and the reading test. The first graders in the three schools received all tests except the test of intelligence and the concept formation test which was

only used with kindergarteners; in addition those in the advantaged school appeared to be so far advanced that the visuo-motor test was not given. Second graders in the disadvantaged and average schools were given most of the tests, but a number were not given in the advantaged school because the pupils' maturity appeared to be so far above the test behavior expected. Third graders in all schools were given reading tests, vision and hearing tests, and the Wepman Auditory Discrimination Test. In addition those in the disadvantaged school were given word and letter discrimination tests.

B. Instruments Used

1. Standardized Tests

- a. Auditory Discrimination Test by Joseph M. Wepman.
Language Research Associates, 950 E. 59th Street, Chicago, Illinois 60637.
- b. Columbia Mental Maturity Scale, Harcourt, Brace & World, New York, New York.
- c. Goodenough Draw-A-Man Scale by Florence L. Goodenough (using directions and norms from her book, Measurement of Intelligence, World Book Co., Chicago, 1926).
- d. Maico Audiometer. Maico Hearing Instruments Inc. 8 S. Michigan Ave., Chicago, Illinois 60603.
- e. Master Ortho-Rater, Bausch & Lomb Optical Co., Rochester, New York.
- f. Metropolitan Achievement Tests, Reading: Primary I and II; Elementary. Harcourt, Brace & World, Inc., New York, New York.
- g. Metropolitan Readiness Tests. Harcourt, Brace & World, Inc., New York, New York.

2. Experimental Tests

- a. Letter Discrimination Tests: Identifying Capital and Lower-Case Letters by Donald D. Durrell (reproduced from his book, Improving Reading Instruction, pages 55-561, Harcourt, Brace & World, New York, New York)
- b. Multiple Concept Attainment Task by Frederick F. Lighthall, Department of Education, University of Chicago. See Appendix.

c. Word Discrimination Test by Allan Muskopf and H. Alan Robinson. See Appendix.

d. Visuo-Motor Test by H. Alan Robinson and Allan Muskopf. See Appendix.

C. Test Administration

The Goodenough Draw-A-Man Scale was the first test administered (September, 1964); it was given individually by one examiner to kindergarteners in the average school. Thereafter it was given to entire class groups from kindergarten through grade three (October-December, 1964) with the exception of the second and third grades in the advantaged school (May, 1965). One person scored all tests for any given group.

Administration of Wepman's Auditory Discrimination Test was begun in the average school (September, 1965) and given to all subjects during the course of the year. Tests were administered to each subject individually. (Crowded conditions in the disadvantaged school caused unavoidable distractions and interruptions during the administration of many of the tests). These tests were administered by a number of trained examiners. The validity score suggested by Wepman was calculated by hand as the test was administered. The results on valid tests were machine-scored.

Metropolitan Readiness Tests were administered before January of 1965 to all kindergarteners and first graders in small groups by one examiner. All results were machine-scored.

The Columbia Mental Maturity Scale was administered individually to all kindergarteners prior to January, 1965. Several examiners gave the tests. All results were machine-scored.

Letter Discrimination and Word Discrimination tests were given to all kindergarteners and first graders, and to average and disadvantage

second graders during the latter part of the school year. Tests were administered by two different examiners to classroom groups with the assistance of classroom teachers. The Letter Discrimination Test was machine-scored; the Word Discrimination Test was scored by hand.

The Visuo-Motor Test was administered to all kindergarteners and to average and disadvantaged first and second graders during the latter part of the school year. The tests were administered and scored by one person. They were given to total classroom groups with classroom teachers assisting.

The visual efficiency test (Ortho-Rater) and the hearing test (Audiometer) were given twice to approximately ten subjects at each grade level in all schools. A number of trained graduate students participated in the test administration. All tests were scored by hand in accordance with the norms provided.

Metropolitan Achievement Tests: Reading were administered to all groups with the exception of kindergarten at the close of the school year. Tests were administered in classrooms by two different examiners with the assistance of the classroom teachers. Tests were machine-scored.

The Multiple Concept Attainment Task was given at the end of the school year to 28 kindergarteners, 14 in the average and 14 in the disadvantaged schools. Two examiners trained by the test constructor administered all tests.

V. Analyses of the Data and Findings

To facilitate statistical computation the raw scores were punched on IBM cards and fed into a 7094 IBM computer. A program entitled Test Scorer and Statistical Analysis 2 by Richard Wolf, UCLA, and Leopold Klopfer, University of Chicago, and a program designed especially for this project by Richard Wolf were used to process the data. Both programs furnished, mean, standard deviation, and correlation coefficient. The program written by Wolf and Klopfer was used to score test results and also to obtain reliability using the Kuder-Richardson Formula 20. The special program supplied reliability data based on the Pearson product moment method.

Essentially the findings are presented in table form. Each table presents for each test the number of subjects, the mean scores, the standard deviations and the test reliabilities expressed in terms of correlation coefficients for each grade level in each school.

A. Goodenough Draw-A-Man Scale

The test-retest technique was used to establish the reliability of the Goodenough. The Pearson product moment method was utilized to compute r .

Table 2 presents findings which show that the Goodenough Draw-A-Man Scale appeared to be reliable in the primary grades for all the schools involved in this study. Coefficients of reliability ranged from approximately 0.72 for the average third grade to 0.92 for the advantaged first grade. All of the coefficients were significant at the .01 level of confidence.

Table 2

Goodenough Draw-A-Man Scale
Test Data Obtained at Different Socio-Economic Strata
Kindergarten Through 3rd Grade

		Socio-Economic Strata																
Disadvantaged						Average						Advantaged						
Grade	N	Test		Retest		r	N	Test		Retest		r	N	Test		Retest		r
		M	S.D.	M	S.D.			M	S.D.	M	S.D.			M	S.D.	M	S.D.	
Kindergarten	33	64.727	10.528	64.364	9.578	0.843	49	67.388	11.651	67.367	11.958	0.844	28	81.000	12.055	81.643	12.446	0.866
1st Grade	26	87.923	13.410	89.077	12.348	0.858	27	86.444	15.298	85.259	14.709	0.893	17	95.471	15.776	94.588	14.036	0.924
2nd Grade	23	88.565	14.665	88.696	13.949	0.906	23	102.783	17.868	101.870	16.666	0.893	22	102.682	15.764	101.318	13.977	0.848
3rd Grade	24	97.250	19.859	98.417	18.531	0.807	25	124.440	17.877	126.360	14.106	0.719	23	109.913	13.443	109.696	14.066	0.906

B. Auditory Discrimination Test

Table 3 on page 14 presents data on valid tests only, not on the total number of tests administered. Wepman states, in the test manual, criteria for determining test validity. Tests found not to be valid were not considered in calculating reliability. Reliability was computed with Kuder-Richardson Formula 20.

Wepman's Auditory Discrimination Test was not reliable for the total sample (see Table 3). Coefficients of reliability ranged from about 0.25 for the average third grade to 0.85 for the disadvantaged second grade. The test was generally reliable for the disadvantaged sample at the .01 level of confidence with the exception of the kindergarten group. It was not particularly reliable for the average sample except at the first grade level where the r of approximately 0.77 was significant at the .01 level of confidence. The test was reliable at the .01 level of confidence with advantaged kindergarteners and first graders.

A number of explanations could account for the low reliability. (1) Wepman has indicated that this test is not reliable for kindergarteners and this was evident in these findings except for the advantaged group whose language level is far more advanced than the normal kindergarten populations. (2) The low reliability coefficients obtained at the second and third grade levels for the average and advantaged groups may have resulted from lack of sufficient variability among the test scores. A limited dispersion of scores will result in low reliability when the Kuder-Richardson 20 Formula is applied to the data. (3) Since the words on this test are enunciated by the examiner and many examiners were used in administering this test, pronunciation differences might have influenced test results.

Table 3

Auditory Discrimination Test by Joseph M. Wepman
Test Data Obtained at Different Socio-Economic Strata
Kindergarten Through 3rd Grade

Socio-Economic Strata												
Grade	Disadvantaged				Average				Advantaged			
	N	M	S.D	r	N	M	S.D	r	N	M	S.D	r
Kindergarten	7	26.71	3.90	0.515	27	30.44	2.74	0.398	29	32.90	4.81	0.836
1st Grade	24	28.42	4.96	0.779	30	35.23	3.32	0.768	23	34.70	3.13	0.751
2nd Grade	27	33.15	4.79	0.850	26	35.50	2.06	0.465	24	35.88	1.68	0.272
3rd Grade	25	34.84	3.34	0.725	29	35.86	1.30	0.252	24	37.54	1.47	0.297

C. Metropolitan Readiness Tests.

The Kuder-Richardson 20 Formula was used to compute reliability. The test was found to be reliable at both kindergarten and first grade levels with all groups. Reliability coefficients ranged from about 0.83 to 0.95. All coefficients were significant at the .01 level of confidence.

Table 4

Metropolitan Readiness Tests
Test Data Obtained at Different Socio-Economic Strata
Kindergarten and 1st Grade

Grade	Socio-Economic Strata											
	Disadvantaged				Average				Advantaged			
	N	M	S.D	r	N	M	S.D	r	N	M	S.D.	r
Kindergarten	40	31.10	12.59	0.907	51	56.47	16.64	0.948	30	83.93	7.77	0.828
1st Grade	31	56.65	18.00	0.952	23	83.74	7.92	0.846	21	92.29	9.17	0.938

D. Columbia Mental Maturity Scale

This scale was administered to all kindergarteners at the beginning of the year. The Kuder-Richardson 20 Formula was used to ascertain reliability. This scale proved to be very reliable for the total kindergarten groups at the .01 level of confidence, although reliability for the disadvantaged group (0.84) was not as high as for the average and advantaged (0.95).

Table 5

Columbia Mental Maturity Scale
Test Data Obtained From Kindergarten at Different Socio-Economic Strata

Socio-Economic Strata	N	M	S.D	r
Disadvantaged	49	34.59	14.11	0.946
Average	52	45.21	13.88	0.948
Advantaged	31	59.87	6.62	0.844

E. Letter Discrimination Test.

This test was administered to all children in the disadvantaged school, kindergarten through grade two in the average school, and kindergarten and first in the advantaged school. The test appeared to be particularly reliable for kindergarteners in the disadvantaged and average groups, and for first and second graders in the disadvantaged groups. Although not quite as high (0.76), it seemed fairly reliable for the average first grade. Correlation coefficients were significant at the .01 level of confidence with the exception of average second grade and advantaged first grade.

Table 6
Letter Discrimination Test
Test Data Obtained at Different Socio--Economic Strata
Selected Grades

Grade	Socio-Economic Strata											
	Disadvantaged				Average				Advantaged			
	N	M	S.D.	r	N	M	S.D.	r	N	M	S.D.	r
Kindergarten	45	27.11	16.11	0.972	21	46.95	7.98	0.966	28	50.29	1.88	0.580
1st Grade	28	46.39	9.60	0.967	31	48.06	2.28	0.758	25	49.80	0.65	0.182
2nd Grade	21	48.62	4.01	0.889	22	50.36	0.79	0.215				
3rd Grade	28	48.89	1.47	0.547								

The Kuder-Richardson Formula 20 was used to compute r. The very low r for average second grade and advantaged first grade may be attributed to a lack of variability among the scores obtained.

F. Word Discrimination Test.

The Kuder-Richardson Formula 20 was also used on this test to calculate r . The extremely low r for grade two of the average group and both kindergarten and grade one for the advantaged group may be accounted for by lack of dispersion among test scores. Each r was significant at the .01 level of confidence with the exception of the three extremely low correlations. The range of correlation coefficient was approximately from 0.34 through 0.89.

Table 7

Word Discrimination Test
Test Data Obtained at Different Socio-Economic Strata
Selected Grades

Grade	Socio-Economic Strata											
	Disadvantaged				Average				Advantaged			
	N	M	S.D.	r	N	M	S.D.	r	N	M	S.D.	r
Kindergarten	47	8.19	4.38	0.882	23	12.65	2.96	0.803	29	14.38	1.40	0.410
1st Grade	28	13.86	2.35	0.772	31	14.48	1.71	0.670	23	15.30	0.97	0.425
2nd Grade	23	13.96	1.85	0.571	22	15.45	0.86	0.342				
3rd Grade	29	15.10	2.18	0.885								

G. Visuo-Motor Test.

Reliability coefficients were obtained through the test-retest method. They ranged from about 0.50 at the average second grade level to 0.87 at the disadvantaged kindergarten level. All were significant at the .01 level of confidence with the exception of the r for the average second grade which was significant at the .05 level. The low reliability in the average second grade may probably be accounted for by the small amount of variability among test scores. The Visuo-Motor Test (Table 8) may be found on page 18.

H. Ortho-Rater Vision Test

The performances of subjects on this test were recorded on Visual Performance Profiles provided by the company producing the test. Performance on the total test was scored Pass, Questionable, Fail on the basis of norms provided for elementary school children. Reliability coefficients were obtained on this test through the test-retest method. See Table 9 on page 20.

It appeared that with the exception of average kindergarteners there were positive correlations in the test-retest situation although most of these were low. Highest correlation coefficients ranged from about 0.75 in the average third grade through 0.92 in the disadvantaged second grade. Only the correlation coefficients for second and third disadvantaged and advantaged were significant at the .01 level of confidence. Correlation coefficients for disadvantaged first and average third were significant at the .05 level.

I. Metropolitan Achievement Tests: Reading

The reliability of these tests were calculated by means of the Kuder-Richardson Formula 20. Because the data processing program was written to analyze tests of not more than 100 items, it was necessary to score these tests by sections. Since the first grade test consisted of fewer than 100 items, it was possible to obtain a reliability figure on the total reading score. These results are presented in Tables 10, 11 and 12.

Table 9

Ortho-Rater Vision Test
Test Data Obtained at Different Socio-Economic Strata
Kindergarten Through 3rd Grade

Socio-Economic Strata																													
Disadvantaged										Average										Advantaged									
Grade	N	Test		Retest		r	N	Test		Retest		r	N	Test		Retest		S.D.	r										
		M	S.D.	M	S.D.			M	S.D.	M	S.D.			M	S.D.	M	S.D.			M	S.D.								
Kindergarten	10	1.700	0.483	1.700	0.483	0.524	8	1.500	0.756	2.125	0.641	-0.147	10	1.900	0.568	2.100	0.568	0.379											
1st Grade	10	1.900	0.568	2.200	0.632	0.681	10	2.000	0.471	1.900	0.568	0.415	10	1.800	0.422	2.000	0.471	0.559											
2nd Grade	10	2.300	0.675	2.200	0.789	0.918	10	2.100	0.876	2.100	0.876	0.275	9	2.444	0.726	2.333	0.707	0.892											
3rd Grade	10	2.200	0.919	2.200	0.789	0.858	10	1.600	0.516	1.800	0.632	0.748	10	2.300	0.675	2.100	0.738	0.825											

Table 10

Metropolitan Achievement Test, Primary I
Test Data Obtained from 1st Graders at Different Socio-Economic Strata

	Test 1. Word Knowledge				Test 2. Word Discrimination				Test 3. Reading				Tests 1, 2, and 3 Combined Data			
	N	M	S.D.	r	N	M	S.D.	r	N	M	S.D.	r	N	M	S.D.	r
Socio-Economic Strata																
Disadvantaged	30	17.23	9.90	0.928	30	17.33	9.64	0.924	30	15.37	9.22	0.897	30	49.93	27.14	0.974
Average	18	25.11	5.80	0.852	18	24.78	5.63	0.892	18	23.33	7.58	0.835	18	73.22	17.44	0.940
Advantaged	25	30.00	5.87	0.899	25	27.40	7.21	0.906	25	26.36	11.70	0.942	25	83.76	22.78	0.973

Table 11

Metropolitan Achievement Test, Primary II
Test Data Obtained from 2nd Graders at Different Socio-Economic Strata

Socio-Economic Strata	Test 1. Word Knowledge				Test 2. Word Discrimination				Test 3 Reading			
	N	M	S.D	r	N	M	S.D	r	N	M	S.D	r
Disadvantaged	28	14.14	9.14	0.937	28	17.50	9.99	0.945	28	17.04	13.01	0.957
Average	15	25.13	5.68	0.844	15	27.73	5.38	0.865	15	29.93	12.69	0.954
Advantaged	25	31.52	6.59	0.931	25	32.40	3.03	0.780	25	41.40	8.93	0.938

Table 12

Metropolitan Achievement Test, Elementary
Test Data Obtained from 3rd Graders at Different Socio-Economic Strata

Socio-Economic Level	Test 1. Word Knowledge				Test 2. Word Discrimination				Test 3 Reading			
	N	M	S.D	r	N	M	S.D	r	N	M	S.D	r
Disadvantaged	32	16.38	10.31	0.926	32	13.97	8.19	0.912	32	10.53	4.59	0.678
Average	31	26.48	11.68	0.944	31	24.29	7.16	0.907	31	25.42	7.65	0.882
Advantaged	24	45.21	3.30	0.697	24	33.75	1.80	0.513	24	36.67	5.21	0.836

For the first grade the reliability of the total reading score was high at each socio-economic level. All sections of the test were highly reliable for the disadvantaged group at all grade levels with the exception of Test 3- Reading (paragraph comprehension) for grade three. Reliability for each section of the test for the average group appeared to be quite high ranging from about 0.83 to 0.95. There was a greater range with the advantaged group (about 0.51 to 0.94). At the advantaged third grade level reliability for Test 1, Word Knowledge, and Test 2, Word Discrimination, was low. The reliability for the Word Discrimination test for the the advantaged second graders was also somewhat low (0.78). Lack of dispersion of scores may account for this finding with this group.

J. Multiple Concept Attainment Task.

This test, administered only to 28 average and disadvantaged kindergarteners, was tested for reliability on the total group of 28 with the split-half technique. Three of the subtests required subjects to place like objects in a category by shape (cylinders), size (tall), and color (yellow). One subtest required the subjects to place objects that didn't match in a group (null). The test is scored for response accuracy and response time. Split-half reliabilities for response accuracy ranged from about 0.39 for cylinders, 0.40 for null, 0.66 for tall, to 0.89 for yellow. For response time, reliabilities ranged from 0.66 for null, 0.74 for tall, 0.87 for yellow, to 0.89 for cylinders.

K. Audiometer Test.

The Maico Audiometer was found to be a reliable instrument for screening auditory acuity. The frequencies from 500 to 3000 were the only ones considered in this study since the Audiogram card indicated the range between these frequencies to be the critical area of understanding. Since results were scored on a pass-fail basis, there was no analysis of frequency and decible levels. Each subject took the test twice. Test-retest performance was consistent resulting in a reliability of 1.00.

VI. Conclusions and Implications

A. Goodenough Draw-A-Man Scale.

The Goodenough scale appears to give a reliable estimate of the intelligence of primary school children in this sample irrespective of socio-economic strata. The lowest r of 0.719 for the 3rd grade average group may suggest limitations in the use of this test for this group, although further investigation is needed.

Since this test can be easily administered to a total class group within 20 minutes and it is substantially reliable for primary graders, it becomes a useful screening instrument in supplementing teacher judgement. It appears to be particularly valuable because of its culture-free characteristics.

B. Auditory Discrimination Test.

Past research and logic leads to the conclusion that auditory discrimination is a significant factor related to reading achievement. Wepman's Auditory Discrimination Test, however, does not appear to be reliable enough to use indiscriminately with all primary graders in the different socio-economic levels represented in this study.

It does, however, seem to be useful because of its reliability with culturally disadvantaged first, second, and third graders. This finding in itself is particularly significant for the results of screening tests of auditory discrimination with a culturally disadvantaged sample may indeed be most helpful in setting up instructional situations. It also appears that the test may be used with advantaged and average first graders in order to obtain information about their abilities in auditory discrimination.

This test as structured appears to be inappropriate for kindergarteners except for those in the advantaged group.

Average and advantaged second and third graders, at least in this sample, do not behave consistently on this test. It appears that this test ought not be used with these subjects or subjects with similar characteristics without further study.

C. Metropolitan Readiness Tests.

Since this test is highly reliable with both kindergarteners and first graders at the three socio-economic levels, it would appear that it could be generally used in measuring a sample of performance related to readiness in reading and mathematics. The high reliability as computed with the Kuder Richardson Formula 20 in this study supports the figure of 0.89 obtained by the publishers in testing and retesting 195 beginning first-grade pupils in four eastern states.

D. Columbia Mental Maturity Scale.

The publishers of this test report an r of .91 for 113 five year old subjects. The present study shows an even higher reliability for disadvantaged and average kindergarteners, but a lower one (0.84) for the advantaged subjects. Nevertheless, this test appears to be substantially reliable for all kindergarteners. It appears to be somewhat culture free but doesn't have the advantage of the Goodenough which may be administered to groups. This test takes about 15-20 minutes per subject.

E. Letter Discrimination Test.

This test appears to be most useful with disadvantaged subjects in kindergarten, first grade, and second as well as with average kindergarteners and first graders. Its low reliability with the total advantaged group, with disadvantaged third graders, and average second graders suggests that it is not appropriate for use with more mature subjects.

F. Word Discrimination Test.

The reliability figures of this test were very uneven. Refinement of the test and further study seem essential. There appears to be a tendency for this test to parallel the Letter Discrimination Test; that is, it does not appear to be reliable for most of the more mature subjects.

G. Visuo-Motor Test.

This test was first administered in a pilot study with average kindergarteners and its reliability in a test-retest situation was 0.69. All subtests were reliable, ranging from 0.62 through 0.84. One subtest which proved unreliable was revised for this study.

In the present study, the reliability of the subtests was not computed but the revision of the one subtest appeared to make the test more reliable for all subjects tested with the exception of average second graders. It would seem that after further experimentation and refinement this test would be useful in testing all kindergarteners, and it might be particularly valuable in ascertaining the visuo-motor skills of culturally disadvantaged subjects.

The predictive validity of this test has not been ascertained at this point. A follow-up study will investigate the relationship of the results on this test with reading achievement.

H. Ortho-Rater Test.

This test has doubtful usefulness for at least kindergarteners and first graders. In the pilot study with 26 average kindergarteners an analysis of the r 's for each subtest ranged from 0.50 through 0.79 for those subtests significant at either the .01 or .05 level of confidence. Other subtests were much lower in reliability.

The present study in ascertaining reliability for the total battery of tests used Pass, Questionable, and Fail as criteria. Reliability appeared adequate for most of the second and third graders in the study.

It would seem that this test ought to be used with caution and the results verified through the utilization of other measurements. On the other hand, the N for each group of subjects in this study on which an r was computed was small. Further extensive evaluation of this instrument seems desirable. An attempt was made to modify the administration of the test to make it more reliable with culturally disadvantaged kindergarteners and disadvantaged and average first graders. The results with the culturally disadvantaged first graders demonstrated some improvement in reliability of some of the subtests but further refinement is needed. (Muskopf and Robinson, 1965).

I. Metropolitan Achievement Tests: Reading.

These tests may certainly be used with confidence in regard to reliability with all first and second graders since the three subtests, Word Knowledge, Word Discrimination, and Reading give substantially consistent results. At the third grade level, however, questions may be raised about the use of the three subtests. Further investigation of the reliability of the Word Knowledge and Word Discrimination subtests with advantaged third graders is needed. In all probability there is a lack of enough dispersion of scores. These subtests may not be measuring the possible variety of performances among the members of this more mature group.

On the other hand the Reading subtest, very reliable for the average and advantaged third graders, needs to be studied as a measurement of the performance of disadvantaged third graders. Here again lack of variability may cause lower reliability but the cause may be generally weak and even performance growing out of lack of language facility in dealing with the running context in the Elementary form of Test 3, Reading.

J. Multiple Concept Attainment Task.

This test appears to hold promise for measuring the ability of culturally disadvantaged and average kindergarteners to conceptualize. As a result of this study and additional experimentation with the test, the constructor of the test is planning to extend the number of trials per task from 10 to 15. This may very well substantially increase the reliability of the test. This test has also been used with nursery school, first, second, third, and fourth grade subjects with equally promising results in terms of reliability.

Further trials are needed in order to measure reliability with the various socio-economic groups. In this study there was no attempt to ascertain reliability for different socio-economic strata on this particular test.

K. Maico Audiometer Test.

This test is very reliable for use with primary children at all socio-economic levels. In fact, it is even highly reliable when testing conditions are somewhat unfavorable. The Maico Audiometer may be used with assurance for screening subjects similar to those who participated in this study.

The results of this study demonstrate that there are some highly reliable instruments for measuring selected factors that may be related to reading success or failure. On the other hand the results also show that some of the tests often used need to be studied more carefully, and perhaps refined, if reliable results are expected with particular groups. The results, in addition, indicate that a few of the experimental tests may, with further experimentation, prove to be reliable tests that measure certain selected factors.

School systems should choose with care and be particularly cognizant of the levels of reliability for particular groups.

Because a reliability figure is significant at the .01 or .05 level of confidence does not make the instrument highly reliable. Although in this study tests with a reliability above 0.78 were generally accepted as being reliable, degree of reliability should be judged in terms of the number of items in a test. Normally the more items in a test, the higher one would expect reliability to be. However, if a test is not reliable about eight or more times out of ten or approximately eighty per cent of the time, for the group whose behavior is being measured, questions must be raised about its results. For most fairly large tests with a number of items measuring specific behaviors, r 's near or beyond 0.90 would seem to give the best indication of reliability.

VIII. Further Research

The data will be further analyzed during the course of this next school year in order to compare the performances of children of different socio-economic strata on those tests found to be reliable in this study.

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INSTRUCTIONS FOR THE STUDENT OF THE COURSE

1. The student should read the text carefully and thoroughly before class.

2. The student should prepare a summary of the text for each class session. This should be done in the form of a paper, which should be turned in to the instructor at the beginning of each class session.

3. The student should prepare a paper for each class session, which should be turned in to the instructor at the beginning of each class session. This paper should be a summary of the text, and should be written in the student's own words.

4. The student should prepare a paper for each class session, which should be turned in to the instructor at the beginning of each class session. This paper should be a summary of the text, and should be written in the student's own words.

5. The student should prepare a paper for each class session, which should be turned in to the instructor at the beginning of each class session. This paper should be a summary of the text, and should be written in the student's own words.

APPENDICES

1. The student should prepare a paper for each class session, which should be turned in to the instructor at the beginning of each class session. This paper should be a summary of the text, and should be written in the student's own words.

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DIRECTIONS FOR MULTIPLE CONCEPT ATTAINMENT TASK (MULCAT-3)

October, 1964 revision -- first used with nursery
school children, 1964

In front of you there are three groups of blocks. The blocks in any one group are all exactly alike in some way. That is what makes them a group.

These blocks (indicate group #1) are all exactly the same in some way, these (indicate #2) are all the same, and these (indicate #3) are all the same in some way. But each group of blocks is different from each other group.

I will take another block, like these (sweep all groups), and will put it here on this spot (indicate gray spot). You are to think about which group that block is most like -- which group that block belongs with. As soon as you see which group that block (indicate spot) belongs with, you should pick up the block and put it in front of the group. For example, if I put a block here (indicate spot), and you think it belongs with this group of blocks, (indicate #2), then you would put the block here, in front (indicate front of #2).

When you are right, I'll tell you, and we'll put the block with the group, like this (cup hand and move imaginary block in front of #2 closer to #2).

Now sometimes, (name), the block that I put out there on the spot will not belong with any of these three groups. When you see a block that does not go with any of these three groups, I want you to put it over here (put insert #4 in place), in front of these blocks. These blocks have been put here because none of them belongs with any of these three groups.

O.K., (name), let's see if you remember how to do it.

1. If I put a block here (indicate spot), and you put it here (indicate front of #2), what will that mean?

2. What if I put a block here (indicate spot) that does not belong with any of the groups; what will you do with it then?

SECURE S's UNDERSTANDING BEFORE PROCEEDING.

Here is the first block. Put it in front of the group that it belongs with as soon as you know where it goes.

(Now, and not before, place first block on the spot, and START TIMING).

Directions for MULCAT-4: the October 1964 Revision of
MULCAT-3

(Directions added as the task proceeds)

When first incorrect placement occurs:

No, (name), that is not right.
That block does not go in that group (with those
blocks). So we'll put it behind the group (blocks)
like this.

When child persists in placing the block with or behind the criterion
blocks instead of in front of them:

Your job, (name), is to put the block
in front (indicate) of the blocks it goes with.
My job is to put it with (indicate) or behind
(indicate) the group. So you do your job and put
blocks in front, and I'll do my job. Ok?

At the first inquiry:

Sometimes we'll stop playing the game for a minute,
and I'll ask you why these (indicate group #1) are
all the same, why these (indicate #2) are all the
same, and why these (indicate #3) are all the same.

Just because I ask you again does not mean you
have given a wrong answer. I will ask you again just
to see if you have changed your mind.

Multi-category blocks -- comment accompanying correct placement:

Yes, (name), that block (it) can go
with that group /or, in case of #4, ... go with those
blocks/.

Assessing category preference; after all placements have been made:

Each of four blocks -- #'s 17, 162, 28, and 42 in that order -- is the subject of a final inquiry.

You put this block -- (take the block in hand, raising it slightly from its location) -- with this group before. (Now put block on the gray spot, saying:) Do you see any other group it can go with?

Assessment blocks for category preference:

#17 -- flat, middle-sized, yellow cylinder.

#162 -- tall, middle-sized, yellow prism.

#28 -- tall, middle-sized, red cylinder.

#42 -- tall, large-sized, yellow cylinder.

Revised Conform. Task - 10/15/63

I.D. _____

Date of testing _____
month day year

Name _____

Sex m f D.o.B. _____
month day year

Bl#	CI	AI	Latncy
19	1		
219	4		
82	3		
223	2		
218	4		
18	1		
167	3		
206	2		

inquiry (start with 1)

31	1		
74	2		
197	3		
78	4		
178	2		
35	1		
202	3		
70	4		

inquiry (start with 3)

107	3		
165	2		
211	4		
25	1		
212	3		
33	1		
119	2		
85	4		

inquiry (start with 1)

Bl#	CI	AI	Latncy
204	4		
39	1		
90	2		
157	3		
88	2		
77	3		
114	4		
21	1		

inquiry (start with 3)

24	1		
172	3		
198	4		
176	2		
127	3		
166	4		
135	2		
38	1		

inquiry (start with 1)

Bl#	CI	AI	Latncy
125	4		
17	(6) 13		
87	(7) 23		
28	(5) 12		

inquiry (start with 3)

162	(7) 23		
174	4		
27	(8) 123		
158	4		
22	(6) 13		
220	4		
26	(5) 12		
42	(8) 123		

inquiry (start with 1)

Revised Conform. Task 10/15/63

Inquiry Responses

> 1.		
> 3.		
> 4.		
> 5.		
> 6.		
> 7.		

EXAMINER'S DIRECTIONS FOR VISUO-MOTOR TEST

Introduction: We are going to play some games I am sure you will enjoy. The most important thing for you to do as you play these games is to listen.

Printing Name: Do you see this space? (Top of page one) Put your finger here. Now, take your pencil and print as much of your name as you can. (Encourage by saying Can You Write Some More?)

Completion: (Demonstrate using a copy of test) You see on your paper a figure that looks like this, a square, and one that looks just like it except that one stick is missing. (Bottom of page one) I want this figure to look just like this one. Watch what I do. I draw in the stick that is missing. (Examiner draws it) Now, you take your pencil and draw in the stick that is missing. Make the second figure look just like the first. Then put your pencil down. In each of the next three items say we want the second figure to look just like the first. Draw in the stick that is missing so that they look exactly alike.

Dots: (Demonstrate using copy of test) This is how you play the game. (page four) Watch me. I put a dot in each circle. The dot must be inside the circle. Now, put your finger on the row of dots up on top of your paper. Take your pencil and put a dot in each circle. Then put your pencil down. This is just practice. (Check). Now, I am going to keep time. When I say go, start here and put a dot in each circle until I say stop. When I say stop hold your pencil way up in the air. Put your hands down by your sides. Ready, go. (Time for 30 seconds) Keep saying Keep Going. (Some will stop at the end of one row, Check). Be Sure To Put The Dot Inside The Circle.

Copying: (Demonstrate using copy of test) Now, you see a figure on your paper that looks like this. (Page five) I want to copy that figure over here. I want to make a figure that looks just like it. Watch how I do it. See, they look just alike. Now,

put your finger in this space. Take your pencil and draw a figure that looks just like this one. Copy it. (For each of the next items) Now copy this figure in the space. Make them look just alike.

Visual memory: (Pages 8 and 9) Now, in this game I am going to hold up a picture. (See 8 figures attached) I want you to look at the picture. Try to remember it. Then I will hide the picture and ask you to draw it. Put your finger in box 1. That is where you will draw the first picture. Now, look. (If they start to draw, stop them. Time for 10 seconds.) Now draw. (For each of the next items) Look, try to remember what you see. Now draw.

Circles: (Page 10) Take your crayone and color the inside of the circle. (Top of page 10) Take your time and do a nice job. (As they finish, collect the tests and give them circle to cut out with name on it -- bottom of page 10). Cut this circle out. Do a nice job.

Figures for Visual Memory subtest:

(presented on 7" x 14" cards)

1. h +

2. Y ⊕

3. h □ ○

4. + + h

5. △ ○ +

6. □ △ R

7. ○ □ + h

8. h + ⊕ △

Directions for WORD DISCRIMINATION TEST

This test can be administered to the whole class at one time. There are two forms of the test. The forms are different only in that the order of the page is different. Each item is presented on a different page in a small booklet. Alternate children are given a different form. The first four items on the test are the same practice items for all children.

1. (On the board print the words as they are in the first item.)
Do you see this first word? Put your finger on this word.
(Check.) Now, I am going to draw a line under this word. Now, I want to find a word that looks just like this word. I slide my finger across until I come to this word. See, it is just like the first word. So I put a line under this word. See, I have put lines under the two words that look just alike. Now you take your crayon and do it. (Check.)
2. (Print the words for the second item on the board.) Now, I am going to draw a line under the first word. Now, I want to find a word that looks just like it. Who can come up and find it? (Allow one child to come up.)
3. (Do the same for item number three.)
4. (On item four, allow them to do it without any demonstration on the board.)
5. Now, I am going to let you do all of the rest of this book by yourselves. If you make a mistake and want to change an answer, raise your hand. Be sure to do all of the pages. (Examiner walks around the room and collects booklets as they are done. He writes the child's name on the front of the booklet.)

Test Items

1. look: ball when look by
2. good: pile goat good if
3. man: farm lost map man
4. ran: run rap ram ran
5. it: well it at hit
6. me: car he me we
7. sing: ring sang sing sings
8. see: saw seen seed see
9. straight: street straight state
10. parks: parked parks park scarf
11. called: call calls called calling
12. there: their three here there
13. on: no one of on
14. pool: loop pole poor pool
15. bad: bud lad bad dad
16. bug: dug bag bug bum

SUMMARY

**IDENTIFICATION OF INSTRUMENTS
TO MEASURE SELECTED FACTORS RELATED
TO SUCCESS IN BEGINNING READING OF
CHILDREN OF DIFFERENT SOCIO-ECONOMIC
STRATA**

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BACKGROUND

There is a great need to be sure that the instruments we use to assess factors related to success or failure in beginning reading are reliable. Without instruments of fairly high reliability we have no way of ascertaining relationships among factors or in learning what factors are predictive of success in reading. And computations of reliability must go beyond the small sampling of a random group. Instructional attention to individual differences can only be significant if we are aware of differences such as those related to socio-economic strata. If we are to help with the culturally disadvantaged in particular, we must be sure that the instruments we use with them are reliable for them.

OBJECTIVES

1. The major objective was the identification of instruments to measure selected factors related to success in beginning reading of children of different socio-economic strata. Specifically the purpose was to determine the reliability of particular measurement instruments at the first four grade levels for three socio-economic levels -- culturally disadvantaged, average, and advantaged.
2. A second objective was to design reliable tests of visuo-motor ability and visual perception of letters and words for kindergarten and grade one.
3. An additional objective was to determine whether or not modifications in test administration would increase the reliability of some tests when used with very young children.

PROCEDURE

A. Subjects

Subjects were selected from kindergarten, grade 1, grade 2, and grade 3 in three school systems. One class at each level was chosen making a total of 12 classrooms.

A public school in the Woodlawn area of Chicago represented the culturally disadvantaged sample. A public school in Cicero, Illinois, represented the average sample. The advantaged group was represented by a private school conducted in affiliation with a university. A total of 529 children took part in the study although all subjects were not used for all tests.

B. Instruments Used.

1. Standardized Tests

a. Auditory Discrimination Test by Joseph M. Wepman.

Language Research Associates, 950 E. 59th Street, Chicago, Illinois 60637.

b. Columbia Mental Maturity Scale, Harcourt, Brace & World, New York, New York.

c. Goodenough Draw-A-Man Scale by Florence L. Goodenough (using directions and norms from her book, Measurement of Intelligence, World Book Co., Chicago, 1926).

d. Maico Audiometer. Maico Hearing Instruments Inc. 8 S. Michigan Avenue, Chicago, Illinois 60603.

e. Master Ortho-Rater, Bausch & Lomb Optical Co., Rochester, New York.

f. Metropolitan Achievement Tests, Reading: Primary I and II; Elementary. Harcourt, Brace & World, Inc., New York, New York.

g. Metropolitan Readiness Tests. Harcourt, Brace & World, Inc. New York, New York.

2. Experimental Tests

- a. Letter Discrimination Tests: Identifying Capital and Lower-Case Letters by Donald D. Durrell (reproduced from his book, Improving Reading Instruction, pages 55-56, Harcourt, Brace & World, New York, New York)
- b. Multiple Concept Attainment Task by Frederick F. Lighthall, Department of Education, University of Chicago. See Appendix.
- c. Word Discrimination Test by Allan Muskopf and H. Alan Robinson, See Appendix.
- d. Visuo-Motor Test by H. Alan Robinson and Allan Muskopf. See Appendix.

C. Test Administration

The Goodenough Draw-A-Man Scale was administered early in the school year of 1964-65 to all subjects in class groups except for the second and third graders in the advantaged school who took it in May. One person scored all tests for any given groups.

Beginning at the first of the school year, Wepman's Auditory Discrimination Test was given throughout the school year. Tests were administered individually by a number of trained examiners.

Metropolitan Readiness Tests were administered before January of 1965 to all kindergarteners and first graders in small groups by one examiner.

The Columbia Mental Maturity Scale was administered individually to all kindergarteners prior to January, 1965. Several examiners gave the tests.

Letter Discrimination and Word Discrimination tests were given to all kindergarteners and first graders, to average and disadvantaged second graders, and to disadvantaged third graders during the latter part of the school year. Tests were administered by two different examiners to classroom groups with the assistance of classroom

teachers. The Visuo-Motor test was administered to the same sample as the letter and word discrimination tests with the exception of the disadvantaged third graders.

The visual efficiency test (Ortho-Rater) and the hearing test (Audiometer) were given twice to approximately 10 subjects at each grade level in all schools. A number of trained graduate students participated in the test administration.

Metropolitan Achievement Tests: Reading were administered to all groups with the exception of kindergarteners at the close of the school year. Tests were administered in classrooms by two different examiners with the assistance of classroom teachers.

The Multiple Concept Attainment Task was given at the end of the school year to 28 kindergarteners, 14 in the average and 14 in the disadvantaged school. Two examiners trained by the test constructor administered all tests.

D. Methods of Analysis.

To facilitate statistical computation the raw scores were punched on IBM cards and fed into a 7094 IBM computer. A program entitled Test Scorer and Statistical Analysis 2 by Richard Wolf, UCLA, and Leopold Klopfer, University of Chicago, and a program designed especially for this project by Richard Wolf were used to process the data. Both programs furnished, mean, standard deviation, and cancellation coefficient. The program written by Wolf and Klopfer was used to score test results and also to obtain reliability using the Kuder-Richardson Formula 20. The special program supplied reliability data based on the Pearson product moment method.

The test-retest technique was used to establish the reliability of the Goodenough Draw-A-Man Scale, Visuo-Motor Test, Ortho-Rater, and Audiometer. The Pearson product moment method was utilized to compute r . Reliability was computed with Kuder-Richardson Formula 20 for the other measuring instruments.

RESULTS

1. The Goodenough Draw-A-Man Scale appeared to be reliable in the primary grades for all the schools involved in this study. Coefficients of reliability ranged from approximately 0.72 for the average third grade to 0.92 for the advantaged first grade. All coefficients were significant at the .01 level of confidence.
2. Wepman's Auditory Discrimination Test was not reliable for the total sample. Coefficients of reliability ranged from about 0.25 for the average third grade to 0.85 for the disadvantaged second grade. The test was generally reliable for the disadvantaged sample at the .01 level of confidence with the exception of the kindergarten groups. It was not particularly reliable for the average sample except at the first grade level where the r of approximately 0.77 was significant at the .01 level of confidence. The test was reliable at the .01 level of confidence with advantaged kindergarteners (0.84) and first graders (0.75).
3. The Metropolitan Readiness Tests were found to be reliable at both kindergarten and first grade levels with all groups. Reliability coefficients ranged from about 0.83 to 0.95. All coefficients were significant at the .01 level of confidence.
4. The Columbia Mental Maturity Scale was very reliable for the total kindergarten group at the .01 level of confidence, although reliability for the disadvantaged group (0.84) was not as high as for the average and advantaged (0.95).
5. Durrell's Letter Discrimination Test appeared to be particularly reliable for kindergarteners in the disadvantaged and average groups (0.97), and for first (0.97) and second (0.89) graders in the disadvantaged groups. Although not quite as high (0.76), it seemed

fairly reliable for the average first grade. Correlation coefficients were significant at the .01 level of confidence with the exception of average second grade and advantaged first grade.

6. The Word Discrimination Test was very reliable particularly for disadvantaged (0.88) and average (0.80) kindergarteners as well as first (0.77) and third (0.89) grade disadvantaged subjects. Reliability was low for other groups tested. The test was not administered to average third graders or advantaged second or third graders.

7. The Visuo-Motor Test was very reliable for all disadvantaged classes: kindergarten (0.87); first (0.79); second (0.84). It was not administered to third graders. It was also quite reliable for the average kindergarten (0.71) and first grade (0.78). In the advantaged group it was administered to the kindergarten only (0.72). Only the average second grade showed a low reliability figure (0.50).

8. Visual efficiency tests with the Ortho-Rater produced positive but mostly low correlations in the test-retest situation with the exception of the minus correlation for the average kindergarten. Highest correlation coefficients ranged for about 0.75 in the average third grade through 0.92 in the disadvantaged second grade. Reliability figures in general were much higher for second and third graders than kindergarteners and first graders.

9. The reading portion (Tests 1, 2, 3) of the Metropolitan Achievement Tests, Primary I, used with all first grade subjects was highly reliable (0.83-0.97). The Primary II form administered to all second graders demonstrated high reliability; the one r below 0.84 occurred with the advantaged third grade on the word discrimination section (0.78). At the third grade level using the Elementary form, there was more variability in reliability. Test 1-Word Knowledge was very

reliable for the disadvantaged (0.93) and average (0.94) third graders but lower for the advantaged (0.70). Test 2-Word Discrimination was highly reliable for the disadvantaged (0.91) and average (0.91) again but rather low for the advantaged (0.51). Test 3 - Reading was fairly low for the disadvantaged (0.68) but higher for the average (0.88) and for the advantaged (0.84).

10. The experimental Multiple Concept Attainment Task showed varying degrees of reliability among its particular tasks. Split-half reliabilities for response accuracies ranged from 0.39 to 0.89; reliabilities for response time ranged from 0.66 to 0.89.

11. The Maico Audiometer was found reliable when using frequencies 500 to 3000 and scored on a pass-fail basis. Test-retest reliability was 1.00.

CONCLUSIONS AND IMPLICATIONS

1. Since the Goodenough Draw-A-Man Scale appears to be a reliable estimate of the intelligence of primary school children irrespective of socio-economic strata, it could be used widely in kindergarten through grade three. Although scoring is somewhat time-consuming and subjective, its chief advantages in addition to reliability brief administration time and ease in administration to total classroom groups.

2. Although Wepman's Auditory Discrimination Test is not reliable for the total primary group, it is particularly reliable for culturally disadvantaged first, second, and third graders. Because auditory discrimination appears to be such an important factor to evaluate culturally disadvantaged subjects, this finding contributes to the usefulness of this instrument. On the basis of this study, the test should not be considered a reliable instrument for average and advantaged second and third graders without further experimentation.

3. The Metropolitan Readiness Tests appear to be reliable instruments for use with kindergarten and first grade subjects at the three socio-economic levels.
4. The Columbia Mental Maturity Scale seems reliable for use with kindergarteners in the three socio-economic levels studies.
5. Durrell's Letter Discrimination Test appears most reliable with disadvantaged subjects from kindergarten through grade two as well as with average kindergarteners and first graders. It does not seem to be very reliable with advantaged primary classes or other more mature subjects.
6. The Word Discrimination Test needs much further experimentation and refinement. It does seem to be most reliable for the lower primary grades, and as is true of the Letter Discrimination Test, not as reliable for the more mature primary subjects.
7. The experimental Visuo-Motor Test obviously needs more refinement and experimentation although it appears promising as a reliable measure for kindergarteners at the three socio-economic levels and for culturally disadvantaged primary subjects in general.
8. The Ortho-Rater Test of visual efficiency appears to be most reliable for second and third graders in the three socio-economic levels. It is not highly reliable for kindergarteners or first graders at any of the levels. Further evaluation of this instrument seems desirable.
9. High reliabilities were obtained with the Metropolitan Achievement Tests, Reading, at the first and second grade levels for subjects in each socio-economic strata. Although the subtests related to reading were very reliable for average third graders, some of the subtests were not highly reliable for disadvantaged and advantaged third graders.

10. Lighthall's Multiple Concept Attainment Task is still in the experimental stage. Results of this study indicate that with further refinement, this test may prove to be reliable and useful for testing the ability to conceptualize among primary subjects.
11. The Maico Audiometer Test is very reliable for use with primary children at all socio-economic levels. It may be used with assurance for screening subjects similar to those who participated in this study.

The results of this study demonstrate that there are some highly reliable instruments for measuring selected factors that may be related to reading success or failure. On the other hand the results also show that some of the tests often used need to be studied more carefully, and perhaps refined, if reliable results are expected with particular groups. The results, in addition, indicate that a few of the experimental tests may, with further experimentation, prove to be reliable tests that measure certain selected factors.

VII. FURTHER RESEARCH

The data will be further analyzed during the course of this next school year in order to compare the performances of children of different socio-economic strata on those tests found to be reliable in this study.

BIBLIOGRAPHY

There are 32 references listed in the final report.